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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/813,532	03/21/2001	Srinath Hosur	TI-30812	3579

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TEXAS INSTRUMENTS INCORPORATED
P O BOX 655474, M/S 3999
DALLAS, TX 75265

EXAMINER

PATHAK, SUDHANSHU C

ART UNIT	PAPER NUMBER
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2634

DATE MAILED: 05/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/813,532

Applicant(s)

HOSUR, SRINATH

Examiner

Sudhanshu C. Pathak

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on March 21st, 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-12 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on March 21st, 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

1. Claims 1-to-12 are pending in the application.

Drawings

2. Figure 2 should be designated by a legend such as "Prior Art" because only that which is known is illustrated. Figure 2 shows a subcarrier structure of an OFDM burst.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 & 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (Antenna Diversity for an OFDM System in a Fading Channel, IEEE Military Communication Conference Proceeding, 1999, Pg. 1104-1109) in view of Dabak et al. (6,424,679).

Regarding to Claims 1 & 7, Lee discloses a method of transmission comprising transmitting a multiple sets of "N" symbols, where "N" is an integer greater than 1, on "N" subcarriers using a Orthogonal Frequency Division Multiplexing scheme (Abstract, lines 1-7, Pg. 1104 & Introduction, lines 1-31). However, Lee does not disclose providing "M-1" transformations of the set of "N" symbols, and transmitting the set of "N" symbols from the first antennas and transmitting the "M-1"

transformations of set of "N" symbols on "N" subcarriers from a corresponding one of "M-1" antennas.

Dabak discloses a transmission method using Space Time Transit Diversity (STTD) in a spread spectrum communication system (Column 1, lines 15-67 & Column 3, lines 55-67). Dabak also discloses implementing antenna diversity in the spread spectrum communications system (Column 1, lines 10-15 & Column 2, lines 6-30 & Fig. 2, elements 204, 206). Dabak further discloses providing transformations of the set of symbols and further transmitting each of the transformations of the symbols on subcarriers from corresponding antennas (Fig. 1 & Fig. 2 & Abstract, lines 1-10 & Column 3, lines 55-67 & Column 4, lines 1-35 & Claim 1 & Claims 6-to-8). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Dabak teaches implementing transforming the input symbols before transmitting the transformed symbols and the non-transformed symbols on respective antennas, and this can be implemented in the OFDM communication system as described in Lee so as to increase the diversity and BER performance of the communication system.

5. Claims 2-6 & 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al. (Antenna Diversity for an OFDM System in a Fading Channel, IEEE Military Communication Conference Proceeding, 1999, Pg. 1104-1109) in view of Dabak et al. (6,424,679) in further view of Vasic (6,178,194).

Regarding to Claims 2, 5, 8 & 11, Lee in view of Dabak discloses an OFDM communication system of transmission comprising antenna diversity wherein

transmitting transformed symbols and non-transformed symbols on multiple subcarriers via corresponding antennas as described above. However, Lee in view of Dabak does not specify the symbols transmitted to include both data and pilot symbols and further the number of symbols transmitted equals 64 of which 48 of the transmitted symbols are data symbols.

Vasic discloses a cellular mobile communication system wherein the known pilot symbols are inserted periodically and transmitted along with the data symbols such the symbols transmitted include both data and pilot symbols (Fig. 1 & Column 1, lines 5-67 & Column 3, lines 10-58 & Column 5, lines 40-67 & Column 8, lines 55-67 & Claim 9). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Vasic teaches inserting pilot symbols into the data symbol train and this can be implemented into the communication system as described in Lee in view of Dabak and this combined symbol train can be transformed as described in the system as described in Lee in view of Dabak so as to perform efficient carrier synchronization in the receiver. Furthermore, the burst size of the number of symbols and the mixture of the number and periodicity of pilot symbols inserted is a matter of design choice and there is no criticality in the mixture of pilot symbols and data symbols, in the symbol stream to be transmitted, wherein a pilot symbol is inserted after every three data symbols.

Regarding to Claims 3 & 9, Lee in view of Dabak in further view of Vasic discloses an OFDM communication system of transmission comprising antenna diversity wherein transmitting transformed symbols and non-transformed symbols on

multiple subcarriers via corresponding antennas, and further the symbols transmitted include both data and pilot symbols as described above. Dabak further discloses providing two transformations, which includes pairwise rotation and complex conjugation of two of the set of symbols (Abstract, lines 1-10 & Fig. 1, 2 & Column 3, lines 55-67 & Column 4, lines 1-35 & Claims 5-7, 17). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Lee in view of Dabak in further view of Vasic satisfies the limitations of the claim.

Regarding to Claims 4 & 10, Lee in view of Dabak in further view of Vasic discloses an OFDM communication system of transmission comprising antenna diversity wherein transmitting transformed symbols and non-transformed symbols on multiple subcarriers via corresponding antennas, and further the symbols transmitted include both data and pilot symbols as described above. Vasic further discloses the symbols are to be QAM (Column 1, lines 55-67). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Lee in view of Dabak in further view of Vasic satisfies the limitations of the claim.

Regarding to Claims 6 & 12, Lee in view of Dabak in further view of Vasic discloses an OFDM communication system of transmission comprising antenna diversity wherein transmitting transformed symbols and non-transformed symbols on multiple subcarriers via corresponding antennas, and further the symbols transmitted include both data and pilot symbols and are QAM symbols as described above. Dabak further discloses the symbols to be transmitted are partitioned into pairs of symbols and the transformations are performed on the paired of the symbols and

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include pairwise rotation and complex conjugation of two of the set of symbols as a pair (Abstract, lines 1-10 & Fig. 1, 2 & Column 3, lines 55-67 & Column 4, lines 1-35 & Claims 5-7, 17). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention that Lee in view of Dabak in further view of Vasic satisfies the limitations of the claim.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sudhanshu C. Pathak whose telephone number is (703) 305-0341. The examiner can normally be reached (Monday-Friday from 8:30 AM to 5:30 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin, can be reached at (703) 305-4714.

Any response to this action should be mailed to:

- Commissioner of Patents and Trademarks Washington, D.C. 20231

Or faxed to:

- (703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to:

- Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor
(Receptionist).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to:

Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.


STEPHEN CHIN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600